

CLAIMS:

1. A method for wafer bonding, the method comprising steps of:
providing wafers to be bonded;
5 cleaning the wafers to remove particle and chemical contaminants from
bonding surfaces of the wafers;
bringing the bonding surfaces of the wafers together to weakly bond the
wafers to each other;
placing the wafers in a pressurization chamber;
10 solely through isostatic pressure, applying bonding pressure to the
wafers;
heating the wafers during said step of applying bonding pressure; and
controlling and maintaining said steps of heating and applying bonding
pressure for a period of time to substantially strengthen bonding between the
15 wafers.
2. The method of claim 1, further comprising steps of:
cooling the wafers; and
removing the wafers from the pressurization chamber.
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3. The method of claim 2, wherein said step of cooling is conducted
while said step of controlling and maintaining continues said step of applying
bonding pressure, followed by a step of depressurization.
- 25 4. The method of claim 1, wherein said step of controlling and
maintaining comprises:
creating a temperature ramp and a pressure ramp to substantially
strengthen bonding between the wafers.

5. The method of claim 4, wherein said step of controlling and maintaining creates the temperature ramp as a function that is independent from the pressure ramp.

5 6. The method of claim 1, wherein said step of heating commences prior to said step of applying pressure.

7. The method of claim 1, wherein said step of heating commences with or after said step of applying pressure.

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8. The method of claim 1, wherein said step of cleaning creates hydrogen terminated surfaces at the bonding surfaces.

9. The method of claim 1, wherein said step of bringing creates one of a
15 Van der Waals and Hydrogen bond.

10. The method of claim 9, wherein said step of bringing brings the bonding surfaces into direct contact with each other without an intervening layer.

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11. The method of claim 9, wherein the wafers are of the same material.

12. The method of claim 9, wherein the wafers are of different materials.

25 13. The method of claim 9, wherein said step of bringing brings together the bonding surfaces with an interlayer between the surfaces.

14. The method of claim 1, further comprising, immediately prior to said step of applying and said step of heating, purging the pressurization chamber.

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15. The method of claim 1, wherein said step of applying bonding pressure comprises using Argon as a isostatic pressure medium.

16. The method according to claim 15, wherein the pressurization
5 chamber comprises a hot isostatic press.

17. The method of claim 1, wherein said steps of providing, cleaning and bringing are repeated to form a plurality of weakly bonded pairs of wafers and said steps of applying, heating, and controlling and maintaining are carried
10 out with the plurality of weakly bonded pairs of wafers simultaneously in the pressurization chamber.

18. The method of claim 1, further comprising, prior to said step of placing, loading said wafers in an unsealed container, and wherein said step of
15 placing is carried out by placing said unsealed container in said pressurization chamber.

19. A method for wafer bonding, the method comprising steps of:
bonding together wafers by bringing the wafers together after the wafers
20 have been prepared;
heating and pressing together wafers bonded in said step of bonding by application of isostatic pressure via a pressure ramp and temperature ramp that strengthens the bond between the wafers bonded in said step of bonding.

20. The method of claim 19, further comprising a step of controlling
25 said heating and pressing to induce strain in at least one of said wafers.